



Discovery of Malaria Plasmodium in an Anopheles mosquito by Ronald Ross - August 20, 1897

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General Note

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Sir Ronald Ross was born in Almora, India in 1857 to Sir C.C.G. Ross, a General in the Indian Army. At the age of eight, he was sent to England to be educated and spent much of his childhood with an aunt and uncle on the Isle of Wight. During his early years he developed interests in poetry, literature, music, and mathematics, all of which he continued to engage in for the rest of his life. At the age of 17 he submitted to his father's wish to see him enter the Indian Medical Service. He began his medical studies at St. Bartholomew's Hospital Medical College, London in 1874. In 1892 he became interested in malaria and, having originally doubted the parasites' existence, became an enthusiastic convert to the belief that malaria parasites were in the blood stream when this was demonstrated to him by Patrick Manson during a period of home leave in 1894. He was the first person to demonstrate, in 1878, that a parasite that causes human disease could infect a mosquito—in this case, the filarial worm that causes elephantiasis.

Malaria is caused by infection with protozoan parasites belonging to the genus *Plasmodium* transmitted by female *Anopheles* species mosquitoes. The malaria parasites begin in 1880 with the discovery of the parasites in the blood of malaria patients by Alphonse Laveran. The sexual stages in the blood were discovered by William MacCallum in birds infected with a related haematozoan, *Haemoproteus columbae*, in 1897 and the whole of the transmission cycle in culicine mosquitoes and birds infected with *Plasmodium relictum* was elucidated by Ronald Ross in 1897. In 1897 Ronald Ross working in India discovered that culicine mosquitoes transmitted the avian malaria parasite *Plasmodium relictum* and suggested that human malaria parasites might also be transmitted by mosquitoes. Later, when working in Sierra Leone in 1899, he demonstrated that the human malaria parasites were indeed transmitted by anopheline mosquitoes. Ross made the crucial break-through and had found the developmental stages of human malaria parasites in anopheline mosquitoes and, in his letters; he calls August 20th 1897 'Mosquito day'. Ross was on the brink of demonstrating that anopheline mosquitoes could transmit human malaria but unfortunately he was not able to complete his studies because at this crucial stage he was posted to Calcutta where there was very little malaria. Ross concluded that mosquitoes fed on infected birds took up male and female gametocytes which fertilized in the mosquito gut and developed into spores on the surface of the mosquito's gut within which rod-like structures were produced that invaded the mosquito's salivary glands and were injected into a new host when the infected mosquito fed. His results were made public in 1898. Ross recorded that one single experiment could bring about the life cycle of human malaria but his military duties took precedence and was sent to work on an epidemic of plague that was then spreading across India and was not allowed to test his hypothesis because of the plague. He died, after a long illness, at the Ross Institute on 16 September 1932.